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SATELLITE STUDIES OF SUSPENDED MATTER AND AQUATIC INTERFACES IN DELAWARE BAY

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SUMMARY

Three successful ERTS-1 satellite passes with negligible cloud cover have produced synoptic imagery showing the instantaneous distribution of suspended matter and aquatic interfaces over Delaware Bay and the adjacent Atlantic coastal region. Data gathered from boats and aircraft at several altitudes during and before the satellite overpasses were used to interpret the imagery and prepare thematic maps. Visual inspection, density slicing, and multispectral analysis of the satellite pictures revealed differences in type and concentration of suspended matter, surface slicks and aquatic interfaces.

The interfaces are a major hydrographic feature in Delaware Bay and frequently include regions of high convergence. In the upper and middle bay the interfaces tend to align along the flow axis of the river or parallel to the shoreline. They are strongest during the ebb portion of the tidal cycle and seem to be associated with velocity shears induced by differences in bottom topography. These boundaries exhibit a strong change in color and turbidity, with Secci depths changing by roughly a factor of two as one crosses them. A correlation has been found between the concentration of sand particles in suspension and the depth, suggesting that most of the heavier particles are lifted into temporary suspension over shoals and shallow areas by currents and waves. The second type of interface is primarily a tidal intrusion of shelf water into the bay during incipient flood tide, with associated discontinuities in salinity and temperature. The convergence properties of such fronts attract heavy accumulations of foam which were found to contain strong concentrations of heavy metals and other toxic substances.

ERTS Multispectral scanner band 5 (0.6 - 0.7 microns) gave the sharpest definition of interfaces between waters of differing turbidity. Band 4 (0.5 - 0.6 microns), due to its deeper water penetration, was more sensitive to patterns having lower turbidity, yet was veiled by a uniform blanket of atmospheric scattering making identification of sediment patterns more difficult. Band 6 (0.7 - 0.8 microns) and band 7 (0.8 - 1.1 microns) clearly delineated the shoreline and discriminated water from land in the marshes. (Observation I.D. Nos. 1024-15073, 1079-15133, and 1042-15074).